Docket No.: 501.43788X00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

Hirotaka NAKAGAWA et al.

Serial No.   10/828,286

Filed: April 21, 2004

For: METHOD, DEVICE AND PROGRAM FOR MANAGING VOLUME

SUPPLEMENTAL PETITION TO MAKE SPECIAL UNDER 37 CFR §1.102(MPEP §708.02)

June 10, 2005

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Supplemental to the Petition to Make Special filed on May 16, 2005, Applicants submit the following additional remarks.

It is submitted that the cited references, whether considered alone or in combination, fail to disclose or suggest the invention as claimed. In particular, the cited references, at a minimum, fail to disclose or suggest in combination with the other limitations recited in the claims:

a first feature of the present invention as recited in independent claim 1 including keeping a correspondence between a level indicating a specific performance of a volume, and storage system characteristics of the storage system, and referencing the storage system characteristics of the first storage system that corresponds to the obtained level indicating the performance of the

volume and storage system characteristics of another storage system that corresponds to the obtained level indicating the performance of the volume, respectively, and comparing the performance of the volumes of the respective storage systems against each other;

a second feature of the present invention as recited in independent claim 11 including keeping a correspondence between a level indicating a specific performance of a volume and a storage system characteristics indicating a performance of the storage systems, obtaining a level indicating a specific performance of a volume of the first storage system, and a level indicating a specific performance of a volume of the second storage system connected to the volume of the first storage system, and comparing the storage system characteristics corresponding to the obtained level;

a third feature of the present invention as recited in independent claim 16 wherein a memory for keeping a correspondence between a level indicating a specific performance of the volume, and storage system characteristics of the storage system, for each of the storage systems, and where the control unit obtains the level indicating the specific performance of the volume of the other storage system, references the storage system characteristics of the first storage system and the other storage system corresponding to the level based on the correspondence, and compares the referenced values;

a fourth feature of the present invention as recited in independent claim 18 wherein a sequence of obtaining correspondences between levels indicating a specific performance of volume, and storage system characteristics of the

storage system, and referencing the storage system characteristics of the first storage system corresponding to the obtained level indicating the performance of the volume, and storage system characteristics of another storage system, and comparing the performances of the volumes of the respective storage systems against each other; and

a fifth feature of the present invention as recited in independent claim 20 wherein the correspondences of the plurality of storage systems, compares the storage system characteristics of the plurality of storage systems corresponding to the level, and based on the result of the comparison, gives an instruction to a different storage system from the storage system having the volume that is already allocated to the host computer, to allocate a volume corresponding to the level; and the storage system volume allocation unit allocates to the host computer a volume having the performance corresponding to the level based on the allocation instruction.

The references considered most closely related to the claimed invention are briefly discussed below:

U.S. Patent No. 4,310,883 (Clifton et al.), discloses a mass storage system that selects a destination storage volume according to specific performance criteria, such as the memory space efficiency, the volume life expectancy, the numbers of users, the shareability of the volume, and the status of the volume. The system sorts the volumes according to each volume's match and risk factors to the data set to be stored. The volumes that best meet the

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performance requirements are selected for data transfer and storage operations. A host computer performs allocation requests, and based on the requests, the best volume or volumes are selected for storage. (See, e.g., Abstract and column 4, line 64, through column 5, line 21.) However, unlike the present invention, Clifton et al. do not disclose a method for obtaining from a first storage system a level indicating a performance of a volume allocated to the computer by the first storage system; and referencing the storage system characteristics of the first storage system that corresponds to the obtained level indicating the performance of the volume and storage system characteristics of another storage system, respectively, and comparing the performances of the volumes of the respective storage systems against each other. More particularly, Clifton et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 11, the above described third feature of the present invention as recited in claim 16, the above described fourth feature of the present invention as recited in claim 18, and the above described fifth feature as recited in independent claim 20, in combination with other limitations in each of the independent claims.

U.S. Patent No. 5,345,584 (Hill) discloses a method for managing the allocation of data sets among a plurality of storage devices, and selecting the storage devices based on the storage volume and the access capability that most nearly meets the requirements of the data to be stored. The invention also calculates a machine storage factor, a residual storage factor, and allocates the

data to a storage device that has sufficient available space and whose performance most nearly matches and exceeds the performance required by the data to be stored. (See, e.g., Abstract and column 3, line 67, through column 4, line 24.) However, unlike the present invention, Hill does not discloses a method for obtaining from a first storage system a level indicating a performance of a volume allocated to the computer by the first storage system; and referencing the storage system characteristics of the first storage system that corresponds to the obtained level indicating the performance of the volume and storage system characteristics of another storage system, respectively, and comparing the performances of the volumes of the respective storage systems against each other. More particularly, Hill does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 11, the above described third feature of the present invention as recited in claim 16, the above described fourth feature of the present invention as recited in claim 18, and the above described fifth feature as recited in independent claim 20, in combination with other limitations in each of the independent claims.

U.S. Patent No. 6,389,432 (Pothapragada et al.) discloses a system and a method for managing storage space in one or more data storage devices. A request for storage space is made by a requester, and the request specifies certain criteria associated with the requested storage space, a table containing storage space attributes is searched, and a data storage space whose attributes best match the specified criteria is selected to become the storage location.

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(See, e.g., Abstract, and column 1, line 60, through column 2, line 4.) However, unlike the present invention, Pothapragada et al. do not disclose a method for obtaining from a first storage system a level indicating a performance of a volume allocated to the computer by the first storage system; and referencing the storage system characteristics of the first storage system that corresponds to the obtained level indicating the performance of the volume and storage system characteristics of another storage system, respectively, and comparing the performances of the volumes of the respective storage systems against each other. More particularly, Pothapragada et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 11, the above described third feature of the present invention as recited in claim 16, the above described fourth feature of the present invention as recited in claim 18, and the above described fifth feature as recited in independent claim 20, in combination with other limitations in each of the independent claims.

U.S. Patent No. 6,598,174 (Parks et al.) discloses a method and apparatus used in a storage network for replacing a storage device that is about to experience a failure condition. The system monitors the conditions of the first storage device, and once it is detected that the first storage device is about to fail, a secondary storage device is selected that can be used as a replacement, then replaces a storage device that is about to fail with a secondary storage device. The method for detecting a condition of a first storage device includes

monitoring such things as whether the device is about to fail, or whether the device is suffering from a reduced performance. Once a particular spare storage device has been selected, the data stored in the first storage device is migrated to the second storage device, and the second storage device replaces the first storage device in the non-redundant array. (See, e.g., Abstract and column 3, lines 16-47.) However, unlike the present invention, Parks et al. do not disclose a method for obtaining from a first storage system a level indicating a performance of a volume allocated to the computer by the first storage system; and referencing the storage system characteristics of the first storage system that corresponds to the obtained level indicating the performance of the volume and storage system characteristics of another storage system, respectively, and comparing the performances of the volumes of the respective storage systems against each other. More particularly, Parks et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 11, the above described third feature of the present invention as recited in claim 16, the above described fourth feature of the present invention as recited in claim 18, and the above described fifth feature as recited in independent claim 20, in combination with other limitations in each of the independent claims.

U.S. Patent No. 6,766,430 (Arakawa et al.) discloses a method and system for reallocating data from one storage location to another storage location. A host collects usage information from a plurality of storage systems,

and determines the relocation destination LU for the data. The relocation destination LU is selected based on specified requirements, including performance conditions and level of reliability. The destination LU may have a higher performance than the primary LU, so that the reallocation increases the processing capacity of the pertinent LU, so that the performance of the computer system is improved. (See, e.g., Abstract and column 21, lines 42-51.) However, unlike the present invention, Arakawa et al. do not disclose a management computer connected via a network to the plurality of storage systems having volumes connected to a computer via a network and storing data used by the computer. More particularly, Arakawa et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 11, the above described third feature of the present invention as recited in claim 16, the above described fourth feature of the present invention as recited in claim 18, and the above described fifth feature as recited in independent claim 20, in combination with other limitations in each of the independent claims.

U.S. Patent No. 6,836,832 (Klinkner) discloses a system and method for selecting disks for use with a volume within a storage system based on suitable performance characteristics. The disks are pre-selected based on a disk table that contains performance characteristics of all the disks affiliated with the storage system and a volume table that contains the characteristics of all the volumes served by the storage system. (See, e.g., Abstract, column 3, lines 6-

36, and column 11, lines 36-50.) However, unlike the present invention, Klinkner does not disclose a method for obtaining from a first storage system a level indicating a performance of a volume allocated to the computer by the first storage system; and referencing the storage system characteristics of the first storage system that corresponds to the obtained level indicating the performance of the volume and storage system characteristics of another storage system, respectively, and comparing the performances of the volumes of the respective storage systems against each other. More particularly, Klinkner does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 11, the above described third feature of the present invention as recited in claim 16, the above described fourth feature of the present invention as recited in claim 18, and the above described fifth feature as recited in independent claim 20, in combination with other limitations in each of the independent claims.

U.S. Patent Publication No. 2004/0024796 (Takeda et al.), discloses a file system in which data is stored on a plurality of volumes in compliance to file storage requests from various applications. The system automatically calculates the storage requirements and determines the storage destination volume on a file by file basis. The storage destination volume is selected in relation to each file specified by a storage request, based on calculated storage requirements, reliability characteristics, or performance characteristics of each volume, and stores the file to the selected destination storage volume. Typical reliability

requirements include the mean time between failure and average operating time. Typical performance requirements include access speed. If two or more storage destination volumes meet the requirements, then the storage volume is selected according to the usage priority defined in the storage destination volume usage priority definition table. (See, e.g., Abstract and paragraphs 14 and 51.) However, unlike the present invention, Takeda et al. do not disclose a method for obtaining from a first storage system a level indicating a performance of a volume allocated to the computer by the first storage system; and referencing the storage system characteristics of the first storage system that corresponds to the obtained level indicating the performance of the volume and storage system characteristics of another storage system, respectively, and comparing the performances of the volumes of the respective storage systems against each other. More particularly, Takeda et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 11, the above described third feature of the present invention as recited in claim 16, the above described fourth feature of the present invention as recited in claim 18, and the above described fifth feature as recited in independent claim 20, in combination with other limitations in each of the independent claims.

U.S. Patent Publication No. US 20040123180 (Soejima et al.) discloses a method and system for remotely copying data from a source volume to a destination volume using a remote copy function, based on two specified

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conditions. The first condition is determining whether the performance of the destination volume after a failover is equal to or higher than the performance of the source volume before the failover. The second condition is determining whether the performance of the destination volume is equal to or higher than the performance of the source volume during the copying process. If these conditions are not met, then the storage apparatus that functions as the destination volume is changed in configuration in order to satisfy these conditions. (See, e.g., Abstract and paragraphs 34-39.) However, unlike the present invention, Soejima et al. do not disclose a management computer connected via a network to the plurality of storage systems having volumes connected to a computer via a network and storing data used by the computer. More particularly, Soejima et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 11, the above described third feature of the present invention as recited in claim 16, the above described fourth feature of the present invention as recited in claim 18, and the above described fifth feature as recited in independent claim 20, in combination with other limitations in each of the independent claims.

U.S. Patent Publication No. 2004/0181641 (Nguyen et al.) discloses a computer implemented method in a data storage system that responds to a fast copy function, to write data from a source volume to a target volume. The storage system includes a host that responds to a fast copy function, and copies

data from a source volume to a target volume. The target volume is automatically selected from a list of available target volumes, based on at least one performance-related criterion and at least one reliability-related criterion. (See, e.g., Abstract and paragraphs 10-11.) However, unlike the present invention, Nguyen et al. do not disclose a method for obtaining from a first storage system a level indicating a performance of a volume allocated to the computer by the first storage system; and referencing the storage system characteristics of the first storage system that corresponds to the obtained level indicating the performance of the volume and storage system characteristics of another storage system, respectively, and comparing the performances of the volumes of the respective storage systems against each other. More particularly, Nguyen et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 11, the above described third feature of the present invention as recited in claim 16, the above described fourth feature of the present invention as recited in claim 18, and the above described fifth feature as recited in independent claim 20, in combination with other limitations in each of the independent claims.

U.S. Patent Publication No. 2004/0268069 (Satoyama et al.), discloses a storage system having multiple storage devices with different interfaces and characteristics, and that copies data from a source volume to a destination volume. In choosing a destination volume, the system takes into consideration the characteristics of the source volume. The characteristics may include: the

type of storage device on which the source volume resides or how the source volume is allocated to different areas of the cache. The system uses the criteria table that lists the selection criteria of destination volumes and views the destination volumes according to the selection criteria. (See, e.g., Abstract, and paragraphs 8-10.) However, unlike the present invention, Satoyama et al. do not disclose a management computer connected via a network to the plurality of storage systems having volumes connected to a computer via a network and storing data used by the computer. More particularly, Satoyama et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 11, the above described third feature of the present invention as recited in claim 16, the above described fourth feature of the present invention as recited in claim 18, and the above described fifth feature as recited in independent claim 20, in combination with other limitations in each of the independent claims.
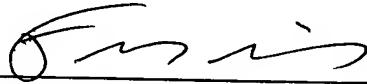
Therefore, since the references fail to disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 11, the above described third feature of the present invention as recited in claim 16, the above described fourth feature of the present invention as recited in claim 18, and the above described fifth feature as recited in independent claim 20, in combination with other limitations in each of the

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independent claims, it is submitted that all of the claims are patentable over the cited references.

In view of the foregoing, Applicant requests that this Petition to Make Special be granted and that the application undergo the accelerated examination procedure set forth in MPEP 708.02 VIII.

Respectfully submitted,

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